ATTACHMENT A

Report on the Integrity of Process Wastewater Conveyance Systems
at the West Valley Demonstration Project (WVDP)
SPDES No. NY-0000973
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I. Purpose/Scope

This evaluation report was prepared in response to the request contained in the March 27, 2002 letter from M. A. Jackson, New York State Department of Environmental Conservation (NYSDEC) to A. C. Williams, U.S. Department of Energy (DOE), to investigate the integrity of process sewers utilized at the WVDP. The following information is included:

1. Current information, including descriptions, on the existing underground process wastewater conveyance system;

2. General observations of the conveyance system integrity and description of the current integrity test program for the conveyance system;

3. An evaluation of integrity test method alternatives and identification of the recommended alternative(s) for implementation; and

4. A proposed schedule for implementing the recommended alternative and reporting the test results to NYSDEC.

II. Current Information

A. Overview of Process Wastewater Conveyance System

The WVDP process wastewater conveyance systems convey untreated, radiologically and/or chemically contaminated wastewater, groundwater and stormwater to facilities for treatment and eventual discharge at SPDES outfall 001. These systems consist of the following six (6) major underground segments that receive flow from approximately 200 drains within the WVDP premises:

1. Line from the NRC-Licensed Disposal Area (NDA) Groundwater Interceptor Trench to Lagoon 2;

2. Lines from North Plateau groundwater wells to the Low-Level Waste Treatment Building (LLW2);

3. Lines from Lagoon 2 to the sump within the LLW2 and overflow line back to Lagoon 2;

4. Line from the New Interceptor to Lagoon 2;

5. Lines from the process building area (Main Process Building, Vitrification Facility, Waste Tank Farm (WTF), 01-14 Building, and Fuel Receiving and Storage (FRS) Facility) to the Neutralization Pit; and

6. The Neutralization Pit, the Old Interceptor, the New Interceptors and the interconnecting lines.

B. NDA Interceptor Trench Transfer Line

Description:

Groundwater is pumped from the NDA Groundwater Solvent Interceptor Trench Manhole No. 4 into an underground line which gravity drains to Lagoon 2. This underground line consists of 2-inch diameter black PVC pipe, (WVDP-RFI-018). The transfer line converts from PVC to 2-inch diameter galvanized steel east of the equalization basin. This line was used to transfer groundwater from the NDA Interceptor Trench beginning in the early 1990s.

NDA Groundwater Characteristics:

Groundwater conveyed by this line is characterized by low levels of beta-emitting radioisotopes. To date, solvent has not been detected in the groundwater transferred from this location. This line is also used to convey small quantities of RCRA non-hazardous lab wastewaters and groundwater monitoring well purgewater from various wells located at the WVDP. The typical flow rate in this line during periods of flow is 500 gallons per day (gpd). Concentrations of chemicals are much less than 1 ppm.

Existing Integrity Information:

An integrity test is performed on this transfer line on an annual basis. According to the Standard Operating Procedure (SOP) 82-01, the test calls for this line to be pressurized with water to a target of 30 psig for a period of 10 minutes. If the pressure during this period remains within 10% (i.e., 3 psig) of the target, the line integrity is considered acceptable for continued use. The most recent test results, generated in July 2001, met the acceptance criteria, as a pressure drop of < 1 psig over a twenty minute period was recorded. For this reason, no additional investigation of line integrity is necessary.

C. Lines from the North Plateau Groundwater Wells to Lagoon 2 and the LLW2

Description:

Underground line, 02-WW-2"-2756, which consists of 2-inch diameter PVC pipe (Drawing No. 900D-7392, Sht. 9), was installed in the mid-1990's. Groundwater is pumped from the North Plateau groundwater extraction wells through this line to the LLW2 Building for treatment. Also, Line 02-WW-2"-2530, a 2-inch diameter PVC pipe, is an alternate route used to convey wastewater from the North Plateau wells to Lagoon 2.

Groundwater Characteristics:

Groundwater conveyed through these lines is characterized by low levels of radioisotopes, primarily Strontium-90. Maximum flow rate through these underground lines is approximately 25 gallons per minute (gpm).

Existing Integrity Information:

There have been no reports by site operations personnel of seepage or leakage in the area where these lines are buried nor at the above ground visible portions of this line. Integrity testing has not been performed since operational commissioning as these are relatively new transfer lines. For this reason, no additional investigation is necessary.

D. Transfer Lines Between Lagoon 2 and LLW2 Building Sump

Description:

Wastewater and stormwater from Lagoon 2 is pumped through a 3-inch diameter, stainless steel pipe 02-WW-3-2754 (Drawing 900D-7392, Sht. 1) to the treatment process feed sump located in LLW2. This sump is also equipped with an overflow line, 02-WWW-4-2755 constructed of 4-inch stainless steel pipe (Drawing 900D-7392 Sht. 1). This overflow line gravity drains wastewater back to Lagoon 2 from the sump. Both lines were constructed and installed into a concrete utility vault as part the construction of the LLW2 Building in the mid-1990's.

Wastewater/Stormwater Characterization:

The Lagoon 2 wastewater/stormwater conveyed by these lines is characterized by low-levels of radioisotopes. As indicated in various State Pollutant Discharge Elimination System (SPDES) permit applications submittals over the years, the wastewater also contains chemical residuals in the ppm range and less from various wastewater treatment and operational processes. Such processes include the laundry, Liquid Waste Treatment System, water treatment (cooling, utility, demineralized), Fuel Receiving and Storage (FRS) pool, facility decontamination, and the laboratories. Chemicals utilized in these processes are primarily commercially available water treatment chemicals.

Existing Itegrity Information:

Because both lines are relatively new, integrity testing has not been performed on these lines. These lines have been visually observed by site operations personnel within the vault with no reports of observed leakage. For this reason, no additional investigation is necessary.

E. Line from Interceptors to Lagoon 2

Description:

Wastewater is batch released from the Interceptors to Lagoon 2 through a gravity drained line 15 -WW-549 (WVDP-RFI-021). This is a 4-inch diameter line constructed of stainless steel and PVC. A lateral conveyance line from the High Level Waste Tank Farm, 8P-11, which connected to this line, as shown on Figure 1, is out of service.

Wastewater Characteristics:

Wastewater conveyed by this line is characterized by low-levels of radioisotopes. The wastewater also contains chemical contaminant residuals from several operations as described in Section D above. Concentrations of residuals carried in this line are relatively higher than that carried by the Lagoon 2/LLW2 sump transfer lines. Concentrations of chemical residuals are typically less than 1 ppm. During batch discharges from the Interceptors to Lagoon 2, flow rate through this line is approximately 22,000 gpd.

Existing Integrity Information:

An integrity test was last performed on this line during July 1996 by site operations personnel. A standpipe was installed near the outlet end to Lagoon 2, the outlet end to Lagoon 2 was capped, and water was then added to an empty Interceptor. The level of water in the stand pipe was then measured and recorded at ten (10) minute intervals over a period of one (1) hour. Recordings indicated no measurable change (measurements taken to the nearest 0.1 inch) in water elevation in the pipe during this period. Based on the results of this test and the relatively high corrosion resistance of the pipe construction materials, no additional investigation of this line is necessary.

F. Transfer Lines from Process Building Area (Main Process Building, Vitrification Facility, WTF, 01-14 Building, FRS Facility, etc.) to the Neutralization Pit

As shown on Figure 1, there are four (4) main lines that currently service the Main Process Building, 01-14 Building, Vitrification Facility , Laundry, Utility Room, Waste Tank Farm, and FRS Facility and carry wastewater and stormwater to the Neutralization Pit, Interceptors, and Old Interceptors. Lines 8P-11 and15-WW-929 also shown on Figure 1, are no longer in service and have not been used in over five (5) years to convey wastewater or groundwater to the Interceptors. Lines 8P-11 and 15-WW-929 are constructed of carbon steel, which has a shorter life expectancy than the materials of construction identified for the lines currently in service. The lines currently in service are summarized as follows:

1) **Lines 15-WW-569 (6-inch diameter) and 15-WW-533 (6-inch diameter):**

Line 15-WW-569 is a main header that services floor drains, sumps and process drains from the Utility Room, Laundry, 01-14 Building, and former fuel reprocessing cells at the south end of the Main Process Building. It also is connected to and receives flow from service Line 15-WW-843, Line 15-WW-571, and Line 15-WW-570 (4-inch diameter). From the point of connection with Line 15-WW-843 to the Neutralization Pit, this line is identified as 15-WW-533.

2) **Line 15-WW-571 (6-inch diameter):**

Line 15-WW-571 conveys wastewater from the sumps and drains in the FRS Building. This line also is connected to and receives flow from line 15-WW-570.

3) **Line 15-WW-570 (4-inch diameter):**

Line 15-WW-570 receives wastewater from sumps, floor drains, process drains, roof drains, and utility trenches for the Vitrification Facility, the High-Level Waste Tank Farm (concrete vault dewatering), and former fuel reprocessing cells at the north end of the Main Process Building. This line also services a storm drain located north of the FRS yard.

4) **Line 15-WW-843 (6-inch diameter):**

This line services sumps, process drains, and floor drains in the central portion of the Main Process Building. It also receives flow from Lines 15-WW-571 and 15-WW-570.

Descriptions:

Design specifications for the above lines, which were constructed in the mid- 1960s, identify an acceptable leakage rate of < 0.2 gallons per hour per inch of pipe diameter per 100 feet (Drawing No. 15R-L-61). This is equivalent to the current acceptance standard of 200 gallons per inch of pipe diameter per mile per day for hydrostatic tests ("Recommended Standards for Wastewater Facilities," 1997 ed.).

The above lines are constructed of Duriron™ ductile pipe connected with bell and spigot joints. The pipe joints were sealed by ramming rope packing into the bottom of each joint and the remainder of the joint was filled with molten lead. This was a commercially acceptable, industry wide practice for process wastewater conveyance systems at the time of construction in the mid 1960's.

Floor and sump drains from the Utility Room connecting to Line 15-WW-569 are constructed of cast iron pipe laid in soil.

The total linear footage of underground drain lines from the Process Buildings to the Neutralization Pit is estimated at 3000 feet. Roughly 60% of the total linear footage of the underground lines are encased in concrete under the buildings. Approximately 170 floor drains are serviced by these lines.

Wastewater Characteristics:

Wastewater conveyed by this line is characterized by low levels of radioisotopes. The wastewater also contains chemical contaminant residuals as described in Section D above. Wastewater meeting the definition of mixed waste or RCRA hazardous waste, such as expired aqueous laboratory standards, and corrosive water treatment chemicals, such as Sodium Hydroxide (used for Lagoon 2 pH adjustment) are discharged into these lines. Chemical residuals are estimated at concentrations ranging in the ppm range and less. Stormwater from roof drains is also conveyed through these lines. Average flow rate in the main header 15-WW-533 is approximately five (5) gpm.

Existing Integrity Information:

Based on the following, to date the WVDP has not performed integrity testing on these lines (see Section III for recommendations). Although integrity testing has not been performed, it is important to note that there have been no indications of leakage from this system since DOE assumed operational control in March 1982. There have been no reported observations of ground seepage along these lines. Site procedures restrict the addition of solids to the drain system to prevent blockage and area flooding as means to control spread of radiological contamination. There have been no reports of blockage in the drain pipes or sinkholes in the vicinity of the drain pipes, thus indicating no loss of pipe integrity. Also, there have been no reports of silt/solids accumulated in the interceptors, such as from pipe collapse. Visual observations of a section of the closed-pipe main header line 15-WW-533 within an existing service manhole during April 2001 provide no indication that the pipe integrity is compromised.

Groundwater Elevation (infiltration/submerged pipe) Assessment:

The transfer lines are approximately five (5) to seven (7) feet below grade. Groundwater water table elevations in the vicinity of the transfer lines are often below the bottom invert elevations. For this reason, the transfer lines are not perpetually submerged below the water table.

Groundwater Quality Assessment:

Historical groundwater data, collected as part of the ongoing site environmental monitoring program, for seven (7) monitoring wells, located near the transfer lines, were reviewed to determine whether a release from the transfer lines has occurred and the extent of impacts to groundwater quality. Data for well nos. 111, 203, 301, 307, 401, 408, and 8605 as shown on Figure 2 were reviewed. A summary of the results of this review are as follows:

Radiological Results:

No unexpected results were noted. Results confirmed above background levels are traceable to historical releases/incidents not related to the process sewer system integrity. Gross beta and Sr-90 concentrations are attributable to the North Plateau gross beta plume. This thoroughly characterized groundwater contamination plume resulted from a release from the Main Process Building during Nuclear Fuel Services operations, prior to U.S. DOE assuming operational control in 1982. (Letter, T. J. Rowland, U.S. DOE to P. D. Eismann, NYSDEC, "North Plateau Groundwater Investigation (Action Code - 21599," dated April 28, 1995).

Metals:

No unexpected results were identified. Results confirmed above background levels are traceable to issues not related to process sewer system integrity. The highest metals concentrations mainly correspond to those metals that are naturally occurring in the indigenous soils and background wells at elevated concentrations. Concentrations of chromium and nickel above background are related to corrosion of stainless steel monitoring well components as documented in previous studies. (Letter, E. A. Lowes, U.S. DOE, to J. Krajewski, NYSDEC, "Distribution of the Final Report: "Evaluation of Pilot Program to Investigate Chromium and Nickel Concentrations in Groundwater of the Sand and Gravel Unit," dated July 2, 1998).

Volatile Organic Compounds (VOCs):

No unexpected VOC results were identified. Detectable levels of VOCs are traceable to releases not related to process sewer integrity. The presence of tributyl phosphate (TBP) at wells 111 and 8605 is attributable to contaminants from the former Lagoon 1, which was taken out of operational service in 1984 and subsequently capped. Other sporadic detections of VOCs were below Practical Quantitation Limits (PQLs) and are not considered significant or reliable.

Water Quality Parameters:

No elevated results were noted.

G. Neutralization Pit, Old Interceptor, New Interceptor

Descriptions:

Neutralization Pit:

Wastewater is conveyed from 15-WW-533 to the Neutralization Pit. The Neutralization Pit is a 9 ft. long, 7 ft. wide, 5.5 ft. deep concrete structure that is located below grade. The walls and floor of this structure are constructed of 6 in. thick concrete. The bottom of the pit is approximately 5.5 ft. below grade within the sand and gravel unit. The tank has a working volume of 800 gallons. Wastewater from the Neutralization Pit is piped to either the Old Interceptor or the New Interceptor.

From 1965 to 1988 sodium hydroxide was added to the Neutralization Pit to neutralize or pH adjust wastewater to 10.5 S.U. Since 1988, sodium hydroxide has been added to wastewater through floor drains in the Utility Room on a seasonal basis. The Neutralization Pit was originally coated with an acid resistant material and it was later relined with stainless steel in November 1967.

Old Interceptor:

The Old Interceptor is a below grade, unlined concrete structure that is 25 ft. wide, 40 ft. long, and 11.5 ft. deep with 12 in. thick walls and floor. Original working capacity of this unit was 50,000 gallons. The structure is covered by a low-lying steel roof. In 1970 a 1 ft. thick layer of concrete was poured into the bottom of the pit as shielding for radioactivity.

The Old Interceptor is used infrequently to manage wastewater with radioactivity levels greater than 5.0E-03 μCi/ml. The wastewater in the Old Interceptor is transferred to the New Interceptors where it is combined with other wastewater prior to transfer to Lagoon 2. During Nuclear Fuel Services (NFS) operations the Old Interceptor was contaminated with higher activity wastes transferred from the FRS Resin Pit and remains contaminated from these early transfers.

New Interceptor:

The New Interceptor was built to replace the Old Interceptor in 1967 due to increasing levels of radioactivity. The New Interceptor is a below-grade, two-compartment concrete basin that is 39.5 ft. long, 22.33 ft. wide, and 11.5 ft. deep. The 14 in. thick concrete walls and floor are lined with 14-gauge 304L stainless steel and the entire structure is covered with a metal roof. A concrete wall divides the Interceptor into a North Tank and a South Tank, each having a working capacity of approximately 22,000 gallons.

Wastewater Characteristics:

Characteristics of wastewater managed in these units are essentially the same as that identified for the transfer lines from Main Process Buildings to the Interceptors. In addition, hydrogen peroxide is added to the Interceptors on a seasonal basis where it is directed to the wastewater holding lagoons for control of algae growth.

Observations Regarding Physical Integrity:

Water levels in these pits can be readily visually observed. To date there have been no reported observations of noticeable inventory loss from these units.

III. Evaluation of Integrity Test Alternatives

From the extensive existing information and observations identified in Section III, there is no indication of failure of the existing process water transfer lines. With the exception of the transfer lines from the process buildings to the Neutralization Pit (item F in Section III), no modifications to the existing monitoring program or additional investigation are recommended at this time.

Five (5) alternative approaches have been evaluated for potential application to assess the transfer lines from the process buildings to the Neutralization Pit. The following is a summary of this evaluation:

A. Smoke Testing

Injection of smoke, generally an effective method for identifying leaks within conventional process sewers, was considered but is not recommended for this application. The ventilation systems within the process buildings operate under negative pressure and draw air up from the process drains. It is expected that injected smoke will backflow through the drains into these areas and likely render the test ineffective. Smoke drawn through the process building could also create worker safety issues.

B. Pressure or Hydrostatic test

For a static water check, the process flows would be shut-off or diverted around segments targeted for testing. The down flow end of the segment would be plugged and line flooded with water loss rate measured at the inlet (e.g., floor drain) end with a graduated stand pipe. The line would be subjected to a minimum positive head of 2 feet with the test performed during a period when the groundwater table is below the lowest invert elevation of the tested pipe. The loss rate would then be calculated and converted to appropriate units for comparison with the original design specification or other appropriate standard. Under this alternative, pressure would be exerted on the pipe and seals from the head of water. This method is not recommended for the following reasons:

* The process sewers were not designed for pressurized application. There is the potential that pressurization could compromise the pipe seals and the integrity of the system;

* Performance of building drain isolation in higher radiologically contaminated areas would risk the spread of radiological contamination and increase the risk for personnel contamination and exposure;

* Extensive work-arounds would be necessary to accommodate process flows; and

* There are floor drains that must be left open within the building. Pressurization could result in the spread of radiological contamination from backflow up through the drains.

C. Infiltration Rate Check at Zeroed Process Sources Flow

This alternative requires the transfer line to be submerged below the groundwater table. The transfer lines are normally not submerged below the groundwater table. For this reason, the infiltration check would be ineffective. As mentioned for the pressure/hydrostatic test alternative, building drain isolation in higher radiologically contaminated areas would risk the spread of radiological contamination and increase the risk for personnel contamination exposure.

D. Water Balance (volume/rate check)

A measured volume or controlled flow rate of water is injected into the sewer and compared with the measured effluent rate at the Neutralization Pit or Interceptor. The loss rate would be compared to an acceptance criteria. If the design specifications are used, the relatively small diameters and short lengths of pipe would result in a calculated acceptance criteria roughly between 0.1 gpm and 0.5 gpm. It is unlikely that the measurement error can be practicably reduced to levels sufficiently below this standard. The fluctuation in process flows from on-going operations may also introduce measurement error, which will likely exceed the calculated acceptance rate.

E. Video Survey

Under this alternative, a camera, mounted on a cable or motorized carriage, would be used to visually observe the interior integrity of the pipes and joints. Video inspection using commercial equipment is constrained by access and pipe configuration, including pipe diameter, distance between access points, and the number of bends in the pipe.

IV. Alternative Proposed for Implementation

Based on the reviewed alternatives, it is proposed that a video survey be attempted using commercial "off-the-shelf" equipment. Sections of the main trunk line, 15-WW-569/15-WW-533 and service laterals 15-WW-843, 15-WW-571, and 15-WW-570, that are found to be readily accessible and amenable to camera usage (i.e., where the pipe bends are limited and the diameter is generally greater than 3 inches) are proposed for the video survey. All flows from the process buildings are conveyed through at least one (1) of these transfer lines before reaching the Neutralization Pit. Mock-up testing, utilizing reproductions of sections of the transfer lines and video survey equipment, would be performed in advance to confirm those sections of the actual sewer system that are amenable to the use of the video survey equipment. It is estimated that anywhere from approximately 100 feet to 1000 feet may be amenable to surveillance with video equipment.

V. Implementation Schedule for Completing Video Survey

Schedule provisions are necessary for implementation of radiological controls for worker safety, procurement of equipment, pre-job worker training, and mock-up testing.

Provided below is a schedule for completing this work:

A. Procure parts/test equipment and/or video inspection services:

   Proposed completion date: March 31, 2003 assuming NYSDEC approval of evaluation method by October 31, 2002.

B. Complete integrity test. Due to worker safety issues in radiological contaminated areas, pre-job training and/or mock–up testing is necessary. Also, it will be necessary to perform work during appropriate weather conditions.

   Proposed completion date: November 30, 2003 assuming NYSDEC approval of evaluation method by October 31, 2002.

C. Submit report to NYSDEC documenting test results:

   Proposed completion date: January 31, 2004.

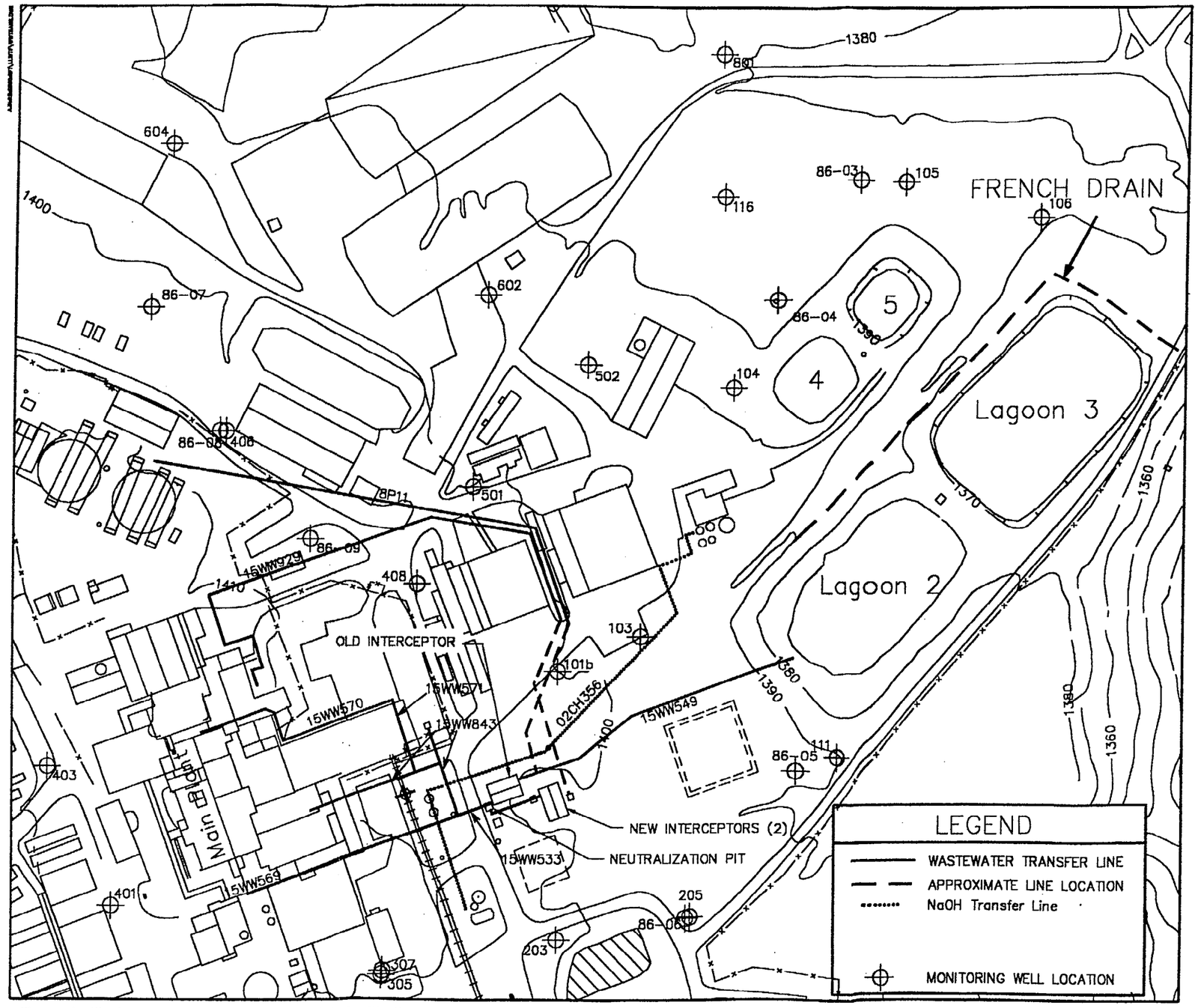

Figure 1. Wastewater Transfer Lines associated with the Low-Level Waste Treatment Facility.

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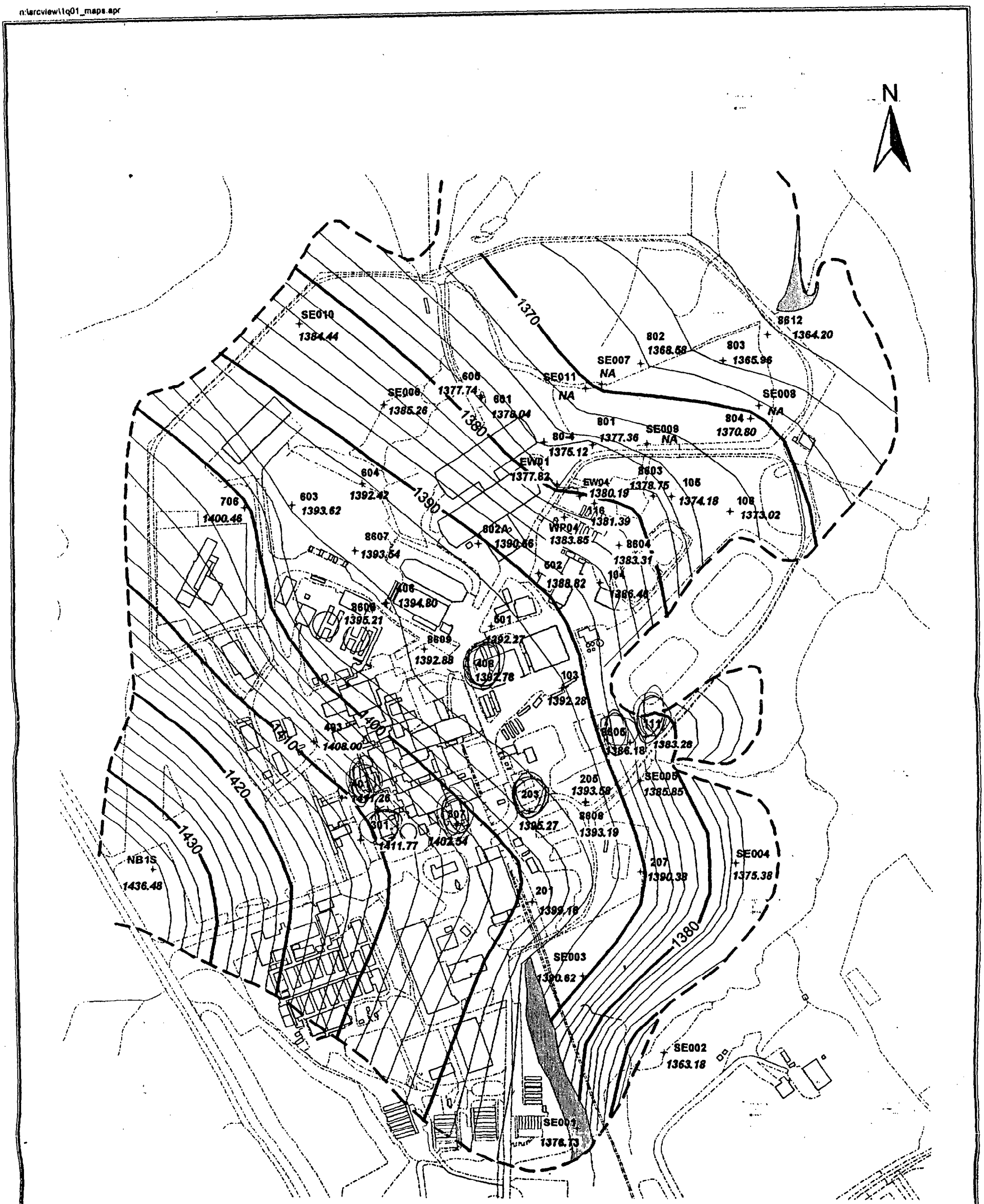

NOTE:
CONTOUR LINES ARE DASHED WHERE INFERRED.

LEGEND

APPROXIMATE EXTENT OF SAND & GRAVEL UNIT

INFERRED ZONES OF SEEPAGE

CONTOUR INTERVAL = 2 FEET
MAP BASED ON 1996 FLY-OVER SURVEY
WATER LEVELS WERE MEASURED ON NOVEMBER 30, 2000
ELEVATIONS AND WATER LEVELS IN FEET ABOVE MEAN SEA LEVEL (M.S.L.)

SCALE

100 0 100 200 300 400 Feet

1st QUARTER 2001
GROUNDWATER ELEVATION CONTOURS OF THE SAND AND GRAVEL UNIT
WEST VALLEY DEMONSTRATION PROJECT
WEST VALLEY, NY

Figure 2